REMARKS

Entry of the foregoing amendments is respectfully requested.

Summary of Amendments

By the foregoing amendments claims 29 and 30 are canceled and new claims 34-41 are added. Accordingly, claims 1-28 and 31-41 are pending in the present application. Claims 1, 5, 9 and 25 are in independent form.

Support for the new claims can be found throughout the present specification and the original claims.

It is pointed out that the cancellation of claims 29 and 30 is without prejudice or disclaimer, and Applicant reserves the right to prosecute the canceled claims in one or more continuation and/or divisional applications.

Summary of Office Action

As an initial matter, Applicant notes with appreciation that a signed and initialed copy of the Form PTO-1449 submitted in the Second Supplemental Information Disclosure Statement filed April 15, 2005 has been returned together with the present Office Action.

Also, concurrently herewith Applicant is submitting a Third Supplemental Information Disclosure Statement and the Examiner is respectfully requested to consider this statement and to return a signed and initialed copy of the Form PTO-1449 submitted therein with the next communication from the Patent and Trademark Office.

Applicant also notes with appreciation that the Terminal Disclaimer with respect to U.S. Patent No. 6,761,777 to Radon has been accepted. Accordingly, Applicant assumes that the rejection of claims 1-24 under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1-25 of the '777 patent has been withdrawn, although this is not explicitly stated in the present Office Action.

Claims 1-5, 9, 13, 15, 21, 23, 24 and 30 are newly rejected or remain rejected, respectively, under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent No. 5,194,221 to Culling (hereafter "CULLING") for the reasons already set forth in the previous Office Action.

Claims 1-5, 9, 10, 13, 15, 21 and 23-33 are newly rejected or remain rejected, respectively, under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent No. 4,793,875 to Larson (hereafter "LARSON") for the reasons already set forth in the previous Office Action.

Claims 1-5, 9, 13, 15, 21, 23 and 24 are newly rejected or remain rejected, respectively, under 35 U.S.C. § 103 as allegedly being unpatentable over U.S. Patent No. 4,487,630 to Crook et al. (hereafter "CROOK") for the reasons already set forth in the previous Office Action.

Response to Office Action

Reconsideration and withdrawal of the rejections of record are respectfully requested in view of the foregoing amendments and the following remarks.

Response to Rejection under 35 U.S.C. § 103 over CULLING

Regarding Applicants' response to the rejection of claims 1-5, 9, 13, 15, 23 and 24 under 35 U.S.C. § 103 over CULLING, the Office Action essentially asserts that "about 4.5 wt.-%" of Mn as recited in, e.g., present independent claims 1 and 9 read on the 4 wt.-% of Mn disclosed in CULLING and that, even if there were no overlap, a *prima facie* case of obviousness would allegedly have been established due to the alleged closeness of the ranges recited in the present claims and those disclosed in CULLING.

Applicant respectfully disagrees with the Examiner that "about 4.5 wt.-%" encompasses "4 wt.-%". Moreover, even if one were to assume that "about 4.5 wt.-%" is close enough to 4 wt.-% to establish a *prima facie* case of obviousness under normal circumstances, it must not be overlooked that CULLING does not merely teach an upper limit of (about) 4 wt.-% of Mn, but additionally makes it very clear that more than (about) 4 wt.-% of Mn in the alloys disclosed therein are not acceptable. For example, in column 4, lines 26-37, CULLING states:

> Alloys of the present invention contain a maximum of about 4% manganese. At higher manganese contents castings from the instant high carbon alloys are susceptible to severe deterioration of their surface when melted in ordinary furnace linings and cast in ordinary mold materials. A major cause of this problem is that the formation of manganese oxides becomes excessive above about 4% manganese in the instant alloys. Since manganese oxides are basic materials they chemically react with the acidic furnace and mold materials and produce gas holes and slags in the surface of the castings.

Emphases added. In column 5, lines 27-32, CULLING further states:

> For example, a higher manganese content eventually promotes the formation of sigma and/or ferrite phases in the instant alloys unless large nickel additions are included in their formulation to help offset this manganese effect.

Emphasis added.

In conformity with the above-cited statements, none of the exemplary alloys of Table I in column 10 of CULLING contains more than 3.89 wt.-% of Mn. CULLING, therefore, does not merely (and incidentally) fail to teach "about 4.5" wt.-% or more of Mn. Rather, CULLING teaches away from using more than (about) 4 wt.-% of Mn.

In view of the unambiguous and clear statements in CULLING, one of ordinary skill in the art would not expect that by raising the Mn concentration above the maximum called for in CULLING it is still possible to obtain acceptable alloys, and certainly would not expect that alloys with a higher Mn concentration than the maximum called for by CULLING are even superior to the latter (as set forth below).

The superior properties of the alloys of the present invention become particularly apparent by comparing, e.g., the tensile strength and hardness values thereof with those obtained with the alloys of CULLING.

For example, the highest tensile strength (in psi) indicated in Table III in column 10 of CULLING is 70,650 and the highest Brinell hardness number is 270. In comparison, the lowest tensile strength (in psi) for alloys according to the present invention given in Table 1 at page 14 of the present application is 95,000 (about 133 % of the maximum of CULLING) and the lowest Brinell hardness number is 450 (about 166 % of the maximum of CULLING). These differences further demonstrate the completely different quality of the alloys according to the present invention in comparison to those of CULLING.

It is respectfully submitted that for at least the foregoing reasons the Examiner has failed to establish a *prima facie* case of obviousness in view of CULLING with respect to any of the claims submitted herewith. Accordingly, withdrawal of the rejection of the present claims under 35 U.S.C. § 103(a) is warranted and again respectfully requested.

In this regard, it is further noted that independent claim 5 recites from about 6 to about 9 wt.-% of manganese. The present rejection does not explain why even a difference of about 2 % with respect to the maximum (i.e., about 150 % of the maximum) called for by CULLING may allegedly be considered to be *prima facie* obvious.

Response to Rejection under 35 U.S.C. § 103 over LARSON

In response to Applicant's reply to the rejection of claims 1, 3-5, 9, 10, 13, 15, 23 and 24 under 35 U.S.C. § 103 over LARSON in the previous Office Action, the instant Office Action appears to allege that the present claims do not define the percentage of austenite in the "austenitic matrix", and asserts that "[m]atrix merely means surrounding material".

In this regard, it is pointed out that the present (independent) claims recite not only an austenitic matrix, but an austenitic matrix "having a face centered cubic crystal structure and being supersaturated with nitrogen in solid solution form". The matrix of LARSON is not characterized as austenitic, but as approximately 50/50 austenitic/ferritic, i.e., as a "duplex austenite-ferrite matrix" (see, e.g., col. 3, lines 43-51). The matrix of LARSON has (i) about 50 % face centered cubic crystal structure (austenite) and (ii) about 50 % body centered cubic crystal structure (ferrite). This is clearly not what is recited in the present claims. If the matrix of LARSON were austenitic as asserted in the present rejection, LARSON would likely have characterized the matrix as "austenitic". However, a matrix which contains only about 50 % of austenite cannot reasonably be called "austenitic", and it cannot reasonably be called "ferritic", either. Accordingly, LARSON characterized the matrix correctly as austenitic/ferritic.

How different the alloy of LARSON is from the alloys of the present invention is also illustrated by the fact that the alloy of LARSON in the as cast form appears to comprise no significant percentage of austenitic structure at all. Only by resorting to a "unique" heat treatment can a part of the ferritic matrix of LARSON be converted into an austenitic structure. Specifically, in col. 4, lines 7-44, LARSON states:

> It should be realized that, although the alloying elements have been selected for optimum properties, the heat treatment used is a mandatory requirement to produce the desired properties. As can be seen from the as-cast microstructure shown in FIG. 1, the matrix phase of ferrite contains a network of grain boundary precipitates, which are carbides, nitrides and carbonitrides.
> The unique heat treatment consists of three steps. The first step is a high temperature treatment at about 2125° F. (1163° C.), to place in solution the carbides, nitrides and carbonitrides and to spherodize those which do not dissolve. This step must be followed by a suitable quench, i.e., oil or an accelerated air cool. At this point, the structure consists of ferrite, with some grain boundary precipitates and a hardness of about 30-31 Rockwell C (285 Brinell). This is illustrated in FIG. 2. As can be seen, most of the grain boundary precipitates are gone.
> The second step of this heat [t]reatment consists of heating to 1700° F. (927° C.) for 6 hours, where diffusional processes can take place and which is the driving force for the matrix precipitation of various carbides, nitrides and carbonitrides, as well as the step which produces the duplex austenitic-ferritic structure. This is illustrated in FIG. 3. At this point, the hardness is about 47-48 Rockwell C (450 Brinell).
> The third step involves a furnace cool from 1700° F. (927° C.), with a rate not to exceed 50° F./hr, to a range of 1100° F. (593° C.), to 1125° F. (607° C.), [w]here copper can precipitate. This increases the hardness to about 51 to 53 Rockwell C (520 Brinell). During this step, there is very little change in the structure and thus the morphology is similar to that shown in FIG. 3.
> As the following data show, this unique combination of alloying elements and heat treatment produces an alloy with remarkable abrasion-corrosion resistance.

Emphases added.

Accordingly, it appears that only by using a "unique" heat treatment is it possible at all to convert at least some (i.e., up to about 50 %) of the ferritic matrix of the alloy of LARSON into an austenitic structure. This is yet another reason why it is not justifiable to call the matrix of LARSON "austenitic".

It further is noted that, in paragraph [0033] of the present application it is explained that the relationship recited at the end of each independent claim "is a measure of the

austeniticity of the present alloys". In other words, an alloy which has a value of less than 1.5 is less austenitic than the austenitic matrix of the present invention. In consideration of the relationship between the value of the expression recited at the end of the present independent claims and the degree of austenicity, the matrix of LARSON is less austenitic than the matrix of the alloys of the present invention, as set forth in the response to the previous Office Action.

Specifically, based on the calculations carried out by the Applicant it appears that in the case of the broad concentration ranges recited in the table in column 2 of LARSON the expression defined at the end of each of the present independent claims would only have a maximum value of 1.4, i.e., significantly lower than the value of 1.5 or higher recited in the present independent claims.

In the case of the preferred concentration ranges in the last table of column 4 of LARSON (see also claim 3 thereof), the maximum value of the fraction would appear to be only about 1.04, and in the case of the (only) specific composition set forth at the top of col. 5, the fraction would have a value of only about 0.75. This clearly teaches away from the invention set forth in the present claims and highlights some of the differences between the alloys of the present invention and those of LARSON.

In this regard, the instant Office Action states at page 6, 3rd paragraph:

> Applicant's calculation in page 19 of instant remarks is noted. But, when narrow concentration ranges recited in instant claim 1 are used for recited expression in instant claim 1 which is way below claimed 1.5. Therefore, it is clear that applicant cannot use all upper or lower limits for calculation.

It is not clear to Applicant what exactly the Examiner wanted to express with these comments and clarification thereof is therefore respectfully requested.

Should the above comments reflect the Examiner's position that with certain combinations of values within the concentration ranges recited in the present claims it is possible to obtain a value of the expression recited at the end of each independent claim of "way below claimed 1.5", Applicant respectfully submits that, this is the very reason why at the end of each of the present independent claims it is made clear that combinations which would result in a value of way below 1.5 (and which would result in alloys which are not sufficiently austenitic) are excluded. LARSON, on the other hand, does not recite any relationship or any other feature which excludes matrices which are not sufficiently austenitic. On the contrary, there is not a single combination of values within the concentration ranges disclosed by LARSON with which a value of 1.5 can be reached. As stated above, the highest possible value obtainable according to LARSON is 1.4.

For at least the reasons set forth above, LARSON fails to render obvious the subject matter of any of the present claims, wherefore withdrawal of the claim rejections under 35 U.S.C. § 103 over LARSON is warranted, and is respectfully requested.

Response to Rejection under 35 U.S.C. § 103 over CROOK

In response to Applicant's arguments regarding the rejection of claims 1-5, 9, 13, 15, 23 and 24 under 35 U.S.C. § 103 as allegedly being unpatentable over CROOK, the present Office Action appears to merely assert that "about 4" wt.-% of Co is either anticipated or rendered obvious by the minimum of 5 wt.-% of Co called for by CROOK.

This assertion is respectfully traversed as well. Applicant points out that, as in the case of Mn and CULLING, "about 4" wt.-% cannot reasonably be assumed to encompass 5 wt.-% (i.e., about 125 % thereof).

Also, CROOK does not merely fail to teach a concentration of less than 5 wt.-% of Co. Rather, it expressly teaches away from using less than 5 wt.-% of Co.

Specifically, CROOK emphasizes the importance of a high cobalt concentration in the alloys disclosed therein. For example, according to col. 3, lines 60-65 of CROOK, cobalt is "especially critical" in the composition of the alloy and the content thereof "must be at least 5 %" to provide an effective increased impact strength.

Further, according to, e.g., the table at the top of columns 3 and 4 of CROOK, a "more preferred" range of cobalt content is 9-15 %, with a "typical range" of 11-13%, which makes it clear that the claimed minimum of 5 wt.-% may be acceptable, but much higher concentrations of Co than 5 wt.-% are certainly more desirable and more advantageous.

All of the present independent claims recite a cobalt concentration of about 4 % or lower, i.e., significantly below the minimum expressly called for by CROOK, and far below the more preferred and typical ranges for cobalt recommended by CROOK. Under these circumstances, it is not seen how CROOK renders obvious any of the present claims.

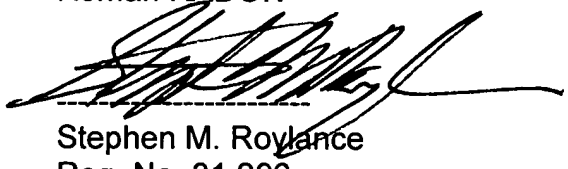
For at least the reasons set forth above, a *prima facie* case of obviousness of the subject matter of any of the rejected claims in view of CROOK has not been established, wherefore the rejection of the present claims under 35 U.S.C. § 103 over CROOK is without sound basis, and withdrawal thereof is respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all of the claims in this application are in condition for allowance, which action is respectfully requested. If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to

contact the undersigned at the telephone number below.

Respectfully submitted,
Roman RADON



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